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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/507,213	02/18/2000	Tinku Acharya	042390.P8350	8186

7590 10/01/2002

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EXAMINER

DO, ANH HONG

ART UNIT	PAPER NUMBER
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2624

DATE MAILED: 10/01/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/507,213

Applicant(s)
Acharya et al.

Examiner
Anh Hong Do

Art Unit
2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 12-29 is/are rejected.
- 7) ☒ Claim(s) 10 and 11 is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 4 and 5 6) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 1, 2 and 24 are rejected under 35 U.S.C. 102(a) as being anticipated by Shishikui et al. (U.S. Patent No. 5,534,927).

Regarding claims 1, 2 and 24, Shishikui discloses:

- applying a process to transform the transformed signal samples from a spatial domain to a frequency domain by 2D-DCT⁻¹ 110 (Fig. 1);

- during the transform process, filtering signal samples, by first applying scaled filter coefficients to signal samples along the image in horizontal direction using horizontal H-LPF 90-1, and then applying scaled filter coefficients to signal samples along the image in a vertical direction using V-HPF 92-2 and V-LPF 92-1, so that at the completion of the transform process of the image, at least selected regions of the transformed signal samples are inversed quantized using Q⁻¹ 15 and Q⁻¹ 25, wherein the horizontal and vertical directions are mutually orthogonal (Fig. 9).

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Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3-9, 12-23 and 25-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shishikui et al. (U.S. Patent No. 5,534,927) in view of Acharya (U.S. Patent No. 5,875,122).

Regarding claim 3, Shishikui teaches Inverse Discrete Cosine Transform 110 (Fig. 1), the first domain is the spatial domain, the second domain is the frequency domain (col. 6, lines 39-47, discloses 2D-DCT for transform an image from a spatial domain to a frequency domain), the first direction is horizontal direction (i.e., a row-wise) and the second direction is vertical direction (i.e., column-wise) (col. 9, lines 38-47).

However, Shishikui does not specifically teach a inverse discrete wavelet transform IDWT. One skilled in the art would clearly recognized that the IDWT is well-known and the Shishikui method facilitates the band division or the decomposition so as to perform high efficiency coding of an image signal.

Acharya, in the same field of endeavor, teaches a IDWT to decompose an input signal into two or more subbands, wherein the IDWT is advantageous for compression since it helps reducing the CPU cycle time so as to perform high efficiency coding of an image signal (col. 3,

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line 63 - col. 4, line 8). Therefore, it would have been obvious to have used the IDWT in Shishikui as taught by Acharya in order to reduce the computation cycle time so as to perform high efficiency coding of an image signal.

Regarding claims 17 and 18, Shishikui discloses:

- applying a process to transform the signal samples from a spatial domain to a frequency domain by 2D-DCT (Fig. 1);
- during the transform process, filtering signal samples, by first applying scaled filter coefficients to signal samples along the image in horizontal direction using horizontal H-LPF 90-1, and then applying scaled filter coefficients to signal samples along the image in a vertical direction using V-HPF 92-2 and V-LPF 92-1, so that at the completion of the transform process of the image, selected regions of the transformed signal samples are quantized by a common value using $Q^{-1} 15$ and $Q^{-1} 25$, wherein the horizontal and vertical directions are mutually orthogonal (Fig. 9).

However, Shishikui does not specifically teach an integrated circuit including digital circuitry and having input ports to receive signal samples associated with at least one image.

Acharya, in the same field of endeavor, teaches an integrated circuit 700 including digital circuitry and having input ports to receive signal samples associated with at least one image to perform the above functions (Fig. 7).

The motivation for combining the two references is set forth in the discussion of claim 3.

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Regarding claims 19 and 25, since this claim recites the same subject matters as those in claim 3, the discussion of claim 3 applies hereto.

Regarding claims 4, 12, 20 and 26, Acharya teaches a two-dimensional / multidimensional IDWT 700 (Fig. 7).

Regarding claims 5, 21 and 27, Acharya teaches a decomposition into mutually orthogonal directions, the decomposition being into low pass and high pass subbands (col. 11, lines 50-55).

Regarding claims 6 and 7, Acharya teaches biorthogonal spline filters comprising 9-7 filters (col. 4, lines 20-23).

Regarding claims 8, 9, 22, 23, 28 and 29, Shishikui teaches a second level (or kth level) of transformation and scaling to the LL subband of the transformed image (col. 9, lines 43-54).

Regarding claim 13, Shishikui teaches the method of quantization is applied to successive video image frames (Fig. 1: Q 106 for quantizing the difference signal between a current video image frame and a previous video image frame, calculated by subtractor 101).

Regarding claims 14 and 15, Shishikui teaches quantizer 106 for truncating and rounding the signal sample values (Fig. 1).

Regarding claim 16, Shishikui teaches the selected portion of the transformed signal samples comprises an entire image of transformed signal samples (col. 1, lines 61-66).

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Allowable Subject Matter

5. Claims 10 and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 10 and 11, the prior art, taken either singly or in combination, does not teach:

- applying the scale factor $1/\sqrt{Q(LL_k)}$ to each filter coefficient in the low pass / high pass filtering operation over the LL_{k-1} subband to generate subbands LL_k and HL_k ;
- applying the scale factor $\sqrt{Q(LL_k)}/Q(LH_k)$;
- applying the scale factor $Q(HL_k) / Q(HH_k) \sqrt{Q(LL_k)}$.

Contact Information

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh Hong Do whose telephone number is (703) 308-6720.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 305-4700 or 4750.

The fax phone number for this Group is (703) 872-9314.

September 28, 2002.

